CHEMICAL ANALYSIS OF ORE TAILINGS REFERENCE MATERIALS

FINAL REPORT

BY

BEAK CONSULTANTS LIMITED

Work on this project was conducted under the auspices of the
Department of Energy, Mines and Resources

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SCIENTIFIC AUTHORITY: Dr. C.W. Smith

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20 June 1988

Mr. Clinton W. Smith
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Dear Mr. Smith:

Enclosed you will find our final submission on our analyses of One Tailings Reference Materials for Contract 09SQ.23440-7-9166. I hope that everything is in order. If there are any questions please don't hesitate to call.

Yours truly

BEAK ANALYTICAL SERVICES

Daniel Andrews

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cc: Jean Routhier
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Chemical Analyses of Ore Tailings Reference Materials

A Report Submitted to the
Department of Supply and Services
for Contract 09SQ.23440-7-9166

ANALYTICAL METHODS

The tailings were analyzed by fusing 0.5 g aliquots of the sample with 2.2 g of lithium metaborate in graphite crucibles.

The samples were heated in a muffle furnace at 1000°C for 20 minutes. The crucibles were removed from the furnace, swirled to gather uncoalesced beads of molten material, then poured into acid-washed teflon beakers containing 100 ml of a dissolving solution (5% HNO_3). The beakers were covered to prevent evaporative loss and stirred with a teflon-covered magnetic stirrer until dissolution was complete. A few drops of HF were added to help dissolve the silica. The resulting solution was analyzed on the Beckman Spectrospan V Direct Current Plasma emission spectrophotometer for the following parameters:

Element Group #1	Element Group #2	Element Group #3	Element Group #4
Silicon	Platinum	Copper	Cobalt
Iron	Palladium	Lead	Nickel
Calcium	Gold	Zinc	
Magnesium			
Aluminum			

To eliminate some of the interference from the matrix, calibration solutions were prepared in blank metaborate fusions (without tailings).

QUALITY CONTROL

As an indication of precision, two replicate fusions were done on separate days of each tailings sample. Replicates were also analyzed with each run. Samples were spiked and standard reference materials were analyzed.

RESULTS

The results of our analyses are presented in Tables 1-8. Please note that nickel concentrations for RTS-2 (A-F) and RTS-4 (A-F) were relatively high and were expressed in mg/g rather than ug/g. Similarly, high concentrations of copper and zinc were encountered in RT3-3 (A-F).

The replicate fusions were performed on separate days by different analysts. Differences between the results are probably due to slight differences in their techniques.

While spiking of the dissolving solution gave excellent recoveries (as expected), spiked samples run through the entire process of fusion, sometimes gave poor recoveries especially for gold, platinum, and palladium. The results of these analyses, therefore, should be flagged.

TABLE 1
RTS 1

Parameter	Units	First Fusion					
		A	B	C[1]	D	E	F
Silicon	%	40.0	40.4	45.6/40.2	41.1	43.4	40.7
Iron	%	17.13	17.3	17.7/17.2	17.8	17.79	17.6
Calcium	%	2.56	2.72	2.66/2.67	2.77	2.74	2.71
Magnesium	%	2.52	2.60	2.62/2.57	2.63	2.69	2.60
Aluminum	%	4.20	4.32	4.36/4.28	4.36	4.48	4.36
Copper	ug/g	564	592	584/598	579	603	608
Zinc	ug/g	579	586	618/606	629	629	628
Cobalt	ug/g	23.0	24.8	23.4/24.0	22.5	25.1	25.0
Nickel	ug/g	21.2	22.4	20.4/21.4	19.6	21.8	21.6
Lead	ug/g	142	152	136/146	128	145	143
Gold	ug/g	12.8	9.6	10.6/11.2	11.8	9.2	10
Plantium	ug/g	38.6	37.0	36.4/39.4	41.2	35.2	38.0
Palladium	ug/g	-	-	-	-	-	-

[1]Sample analyzed in replicate

TABLE 2
RTS 1

Parameter	Units	Second Fusion					
		A	B	C	D	E	F
Silicon	%	-	39.7	43.2	39.5	41.1	41.7
Iron	%	-	20.9	21.2	21.4	20.1	20.6
Calcium	%	-	2.78	2.77	2.75	2.72	2.80
Magnesium	%	-	2.57	2.68	2.70	2.52	2.55
Aluminum	%	-	4.30	4.54	4.50	4.27	4.25
Copper	ug/g	-	660	614	598	495	489
Zinc	ug/g	-	653	650	622	641	661
Cobalt	ug/g	-	32.8	27.3	29.3	29.1	31.0
Nickel	ug/g	-	31.7	25.3	23.3	26.3	31.7
Lead	ug/g	-	205	167	157	159	214
Gold	ug/g	-	12.7	11.0	13.7	11.2	11.7
Platinum	ug/g	-	-	-	-	-	-
Palladium	ug/g	-	8.17	5.07	9.16	6.19	6.35

TABLE 3
RTS2

Parameter	Units	First Fusion					
		A	B	C[1]	D	E	F
Silicon	%	5.928	5.949	6.01/6.46	5.46	5.71	6.36
Iron	%	33.21	32.76	33.6/33.7	33.0	33.2	33.5
Calcium	%	0.572	0.552	0.580/0.568	0.576	0.580	0.568
Magnesium	%	0.360	0.357	0.362/0.367	0.364	0.367	0.364
Aluminum	%	0.836	0.844	0.840/0.860	0.820	0.836	0.832
Copper	ug/g	660	658	670/650	674	700	673
Zinc	ug/g	130	130	129/131	130	133	137
Cobalt	ug/g	82.0	81.5	81.1/81.6	84.0	86.6	86.2
Nickel	mg/g	2.58	2.52	2.30/2.39	2.33	2.44	2.33
Lead	ug/g	92.6	91.7	102/95.2	98.8	108	113
Gold	ug/g	10.8	9.6	9.4/11.4	9.0	9.6	11.4
Platinum	ug/g	49.0	45.6	47.0/48.4	44.2	48.4	52.2
Palladium	ug/g	-	-	-		-	-

[1] Sample analyzed in replicate

TABLE 4
RTS2

Parameter	Units	Second Fusion					
		A	B	C[1]	D	E	F
Silicon	%	6.24	6.20	6.10	6.48	6.51	6.29
Iron	%	37.2	37.9	36.5	38.1	38.7	37.2
Calcium	%	0.545	0.538	0.557	0.570	0.587	0.562
Magnesium	%	0.354	0.344	0.343	0.355	0.358	0.349
Aluminum	%	0.799	0.781	0.795	0.840	0.853	0.825
Copper	ug/g	628	-	-	-	-	-
Zinc	ug/g	135	-	-	-	-	-
Cobalt	ug/g	90.8	-	-	-	-	-
Nickel	mg/g	2.26	-	-	-	-	-
Lead	ug/g	162	-	-	-	-	-
Gold	ug/g	12.1	12.0	12.5	13.7	14.1	13.4
Platinum	ug/g	-	-	-	-	-	-
Palladium	ug/g	6.76	5.78	7.55	7.33	8.13	7.17

TABLE 5
RTS3

Parameter	Units	First Fusion					
		A	B	C	D	E	F
Silicon	%	36.2	35.9	36.0	33.1	42.3	37.5
Iron	%	18.9	19.6	19.4	19.4	19.9	19.2
Calcium	%	2.27	2.31	2.28	2.30	2.31	2.24
Magnesium	%	2.43	2.48	2.47	2.50	2.53	2.47
Aluminum	%	4.88	5.04	5.00	5.12	5.16	5.04
Copper	mg/g	2.96	2.98	3.02	3.03	3.06	2.98
Zinc	mg/g	2.06	2.14	2.06	2.06	2.08	2.10
Cobalt	ug/g	276	304	290	288	300	296
Nickel	ug/g	81.2	92	88.8	89.4	93.2	87.0
Lead	ug/g	212	250	242	248	258	236
Gold	ug/g	9.6	11.0	9.4	8.6	10.4	10.8
Platinum	ug/g	40	39.4	39.6	40.0	42.0	37.8
Palladium	-	-	-	-	-	-	-

TABLE 6
RTS 3

Parameter	Units	Second Fusion					
		A	B	C	D	E	F
Silicon	%	30.1	31.7	30.7	34.2	33.5	33.7
Iron	%	20.0	21.5	21.2	22.1	21.5	21.5
Calcium	%	2.08	2.33	2.21	2.32	2.24	2.19
Magnesium	%	2.20	2.29	2.25	2.34	2.32	2.37
Aluminum	%	4.54	4.64	4.60	4.75	4.76	4.82
Copper	mg/g	-	-	-	-	-	-
Zinc	mg/g	-	-	-	-	-	-
Cobalt	ug/g	-	-	-	-	-	-
Nickel	ug/g	-	-	-	-	-	-
Lead	ug/g	-	-	-	-	-	-
Gold	ug/g	9.47	12.2	11.5	12.1	10.6	9.56
Platinum	ug/g	-	-	-	-	-	-
Palladium	ug/g	4.73	5.11	4.37	6.14	5.51	5.58

TABLE 7
RTS 4

Parameter	Units	First Fusion					
		A	B	C	D	E	F
Silicon	%	2.08	2.07	1.99	2.12	2.14	2.13
Iron	%	48.6	49.3	49.3	48.9	50.3	49.6
Calcium	%	0.372	0.363	0.364	0.364	0.379	0.369
Magnesium	%	0.204	0.214	0.203	0.205	0.210	0.219
Aluminum	%	0.367	0.388	0.362	0.365	0.372	0.380
Copper	ug/g	291	299	279	280	284	239
Zinc	ug/g	168	172	172	178	180	175
Cobalt	ug/g	213	221	210	212	216	195
Nickel	mg/g	7.84	7.92	7.72	7.96	8.36	7.68
Lead	ug/g	187	202	187	162	154	146
Gold	ug/g	18.2	18.4	19.4	21.0	21.4	20.8
Platinum	ug/g	68.4	69.4	70.8	66.8	66.2	64.4
Palladium	ug/g	-	-	-	-	-	-

TABLE 8

RTS 4

Parameter	Units	Second Fusion					
		A	B	C	D	E	F
Silicon	%	2.16	2.14	2.08	2.04	2.05	2.11
Iron	%	44.2	42.6	47.3	52.8	53.6	47.8
Calcium	%	0.384	0.358	0.338	0.359	0.366	0.379
Magnesium	%	0.202	0.218	0.194	0.202	0.211	0.192
Aluminum	ug/g	0.373	0.368	0.365	0.370	0.348	0.361
Copper	ug/g	-	-	-	-	-	-
Zinc	ug/g	-	-	-	-	-	-
Cobalt	ug/g	-		-	-	-	
Nickel	mg/g	-		-	-	-	
Lead	ug/g	-		-	-	-	
Gold	ug/g	18.8	18.2	17.2	20.9	21.5	18.5
Platinum	ug/g	-	-	-	-	-	-
Palladium	ug/g	8.84	9.27	8.28	9.56	9.34	9.36